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West's Improved Pump.

There is no more certain evidence in history of the civilization of a people, and their advancement in intelligence, refinement, and it may be added morality, than to mark the progress they have made in the science of hydraulics, in its various branches, and especially in the perfection of appliances for raising water.

Judging by this standard America is the most civilized nation on the face of the globe, because its inventors have furnished more and better pumps than those of any other nation.

In this connection will be found illustrations of West's Pump, which has been improved until it seems to be all that could be desired.

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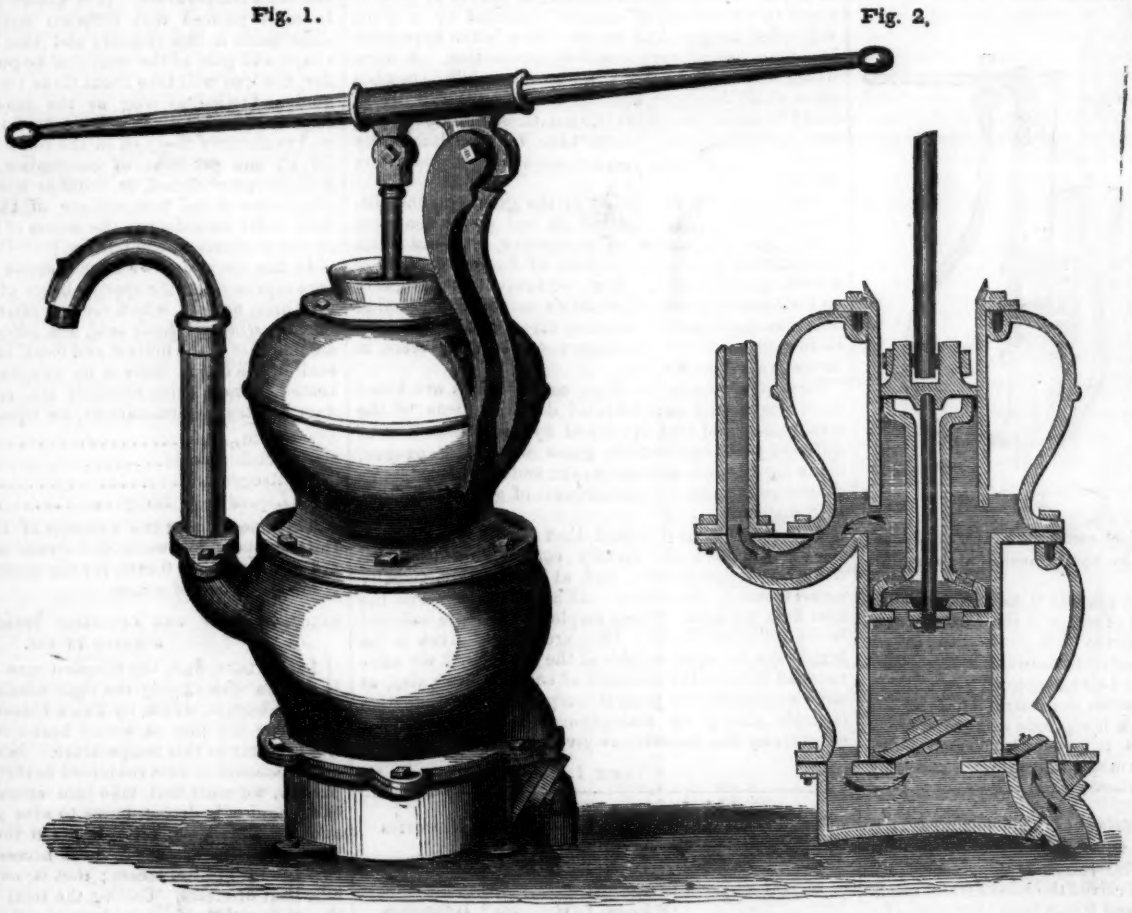
This pump seems to be exceedingly well adapted for raising water for gas works for purifying purposes, and for supplying engines, etc. It is not liable to freeze owing to the protection of the air chambers, and by a simple contrivance the chambers can be emptied in very cold weather, if necessary.

Fig. 1.

Fig. 2.



WEST'S IMPROVED PUMP.

Fig. 3, shows its application to deep wells.

Fig. 4, is the form of a house or sink pump, or fountain.

Fig. 5, is an ordinary farm pump, which is also a force or fountain.

For further information, apply or address, J. D. West & Co., 40 Courtland street, N. Y.

(*For Figs.* 3, 4, *and* 5, *see next page.*)

Is Water Necessary to Mitigate the Effects of Dry Air from Heating Furnaces.

The Boston *Journal of Chemistry* takes the negative of the above question? It maintains—what no one ever denied—that when air is heated it contains all the moisture it contained before heating, but it comes to a conclusion—which every scientific man will deny—that it is therefore absurd to suppose any addition of moisture is requisite.

As we have said, no one has ever thought of denying that air loses none of its moisture by heating. The fact is, however, that when so heated its appetite for water is vastly increased, and not only its appetite is increased, but its capacity to seize upon and hold water is increased. In this state it sucks at every pore in the skin, robs the delicate membranes of the eyes and nostrils of their moisture, enters the lungs drying and irritating them, causes the lips to crack, and otherwise injures the animal economy.

If its appetite is appeased from other sources, it does no mischief, and this can best be done by putting a trough in its path at which it can drink its fill before it enters the apartment.

That air, heated, has its capacity for moisture increased, has long been a demonstrated fact, and calls for no additional proof at this time. But it finds a proof in a well known fact, which we only bring forward to show another kind of mischief resulting from

not satisfying the demand for moisture, and to obviate which, were no other reason tenable, particular attention to supplying water to heating furnaces is demanded We allude to the effect produced by dry hot air upon furniture, and the joiner work in buildings.

Carpenters and cabinet-makers will affirm that wood of all kinds shrinks very much more under the circumstances mentioned, than where the air supplied to rooms attains a proper hygrometric condition before it enters them. And the most superficial observer can scarcely fail to be convinced of the truth of this statement if situated to observe and contrast the effects of moist and dry air upon wooden articles. We have seen these effects upon the panels of the doors, almost ready to drop out, and upon furniture the glued joints of which were torn asunder by undue and enequal shrinkage caused by the fiery simoons from the registers, which too often convert parlors into ovens which kiln-dry not

Fig. 3.

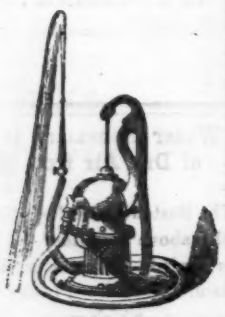


Fig. 4.

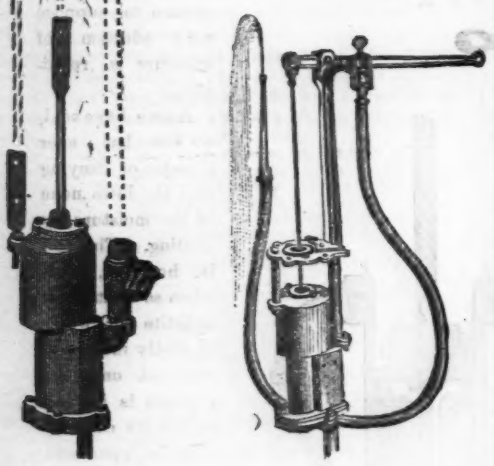


Fig. 5

only every inanimate object containing any moisture, but also the dwellers in these health-blighting inclosures.

It costs some trouble to prevent these evil results by keeping an ample supply of water in the furnaces, but it will cost more trouble not to do it.

Any one who has attempted to cultivate house-plants in a room warmed by heated air has noticed how quickly they droop and languish when the water is out of the heater, and there are not a few people who are so sensitive to the effects of what is generally termed "dry heat," that they can determine almost immediately, by their uncomfortable sensations, when the water supply has failed.

We trust the article referred to will not have the effect to render any one who uses a hot-air furnace neglectful to keep the water reservoir constantly supplied. This subject has received the most careful attention from scientific men, and it has been long generally admitted that without proper attention to this important particular, hot-air furnaces are capable of doing great mischief.—*Scientific American.*

A general order, promulgated from the War Department, provides that hereafter no volatile oils will be issued or used for illuminating purposes at military posts, and all varieties of coal oil will be regarded as volatile. In general, lard oil will be supplied for issues of oil authorized for the necessary illumination of military posts.

Chemical Repertory.--No. 24.

MARCH 2, 1870.

Editor—HENRY WURTZ.

American Chemical News.

INVESTIGATION OF FLAME TEMPERATURES; IN THEIR RELATIONS TO COMPOSITION AND LUMINOSITY.

By B. Silliman and Henry Wurtz.

FIRST MEMOIR.

CALORIFIC POWERS OR EFFECTS OF GASES.

[Read to the American Association at Salem, August, 1869.]

These subjects lie, in our belief, at the very basis of the true theory of the phenomena of luminiferous gases, and have practical bearings that can scarcely be overrated.

In fact, our studies of the subject have led us in the direction of the general conclusion that, all other conditions being equal, the *temperature*, in a given flame, is the main factor of luminosity. This, however, may as yet be regarded merely as a hypothesis; in consequence of the imperfection of our present means of actual experimental demonstration of the temperatures of flames. It is a hypothesis, nevertheless, which is in general accordance with known facts. By the spectroscope, for example, which can recognize only luminous rays, we find that the higher the temperature the greater the number of these luminous rays. The recent results of Frankland upon the development of luminosity by increased pressure, in flames which are non-luminous under atmospheric pressure, are in accordance with this view; increase of temperature necessarily following increase of pressure.

Very vague views have been rife, even among chemists, with regard to the temperatures of luminiferous flames. Some have been satisfied with believing crude hypotheses; such as that the heat power of a flame is always proportional to the *density* of the gas or vapor undergoing combustion; or that it is proportional to the *amount of oxygen consumed* by a given volume of the gas; and so on. This latter hypothesis has been one of very common acceptation. A view which is even now entertained by some skilful chemists (than which, however, nothing, as will be shown below, could be more fallacious) is, that those individual gaseous compounds which impart the highest luminosity under ordinary conditions, are also the most productive of heat.

The admirable researches of the great gas-chemist, Bunsen of Heidelberg, placed in our possession some years ago the means of computing, at least with approximate accuracy, the heat of flames of gases of known compositions. Few however have properly and successfully applied Bunsen's methods in practice. We consider it quite time that these methods should be introduced to the knowledge of Gas Engineers, in forms available to them.

Bunsen's *formulæ* for these computations are based upon the actual experimental determinations of the *total* amounts of heat developed by the combustion of different pure combustible gases with pure oxygen, made by Favre and Silbermann: and upon Regnault's determinations of the specific heats of gaseous products of combustion.

It is not to be maintained that Favre and Silbermann's numbers are strictly correct, but they are doubtless approximate, and at least proportionally correct among themselves. At any rate, they are the best data we have. Those employed here are included in the following Table. They are usually given in the text-books for equal *weights* of the gases, but we have reduced them to the standard of equal *volumes* also, as more suitable to our present purpose. This reduction is made simply by multiplying the equivalents for weights, by the densities as given in the third column.

Table I.

	Total Calorific Equivalents.		Densities on Scale of Hydrogen —1.
	Of Equal Weights.	Of qu Vo	
Carbonic Oxide...	34,462° C	34,462°C.	1.
Hydrogen.....	2,403° "	33,642° "	14.
Marsh Gas.....	13,063° "	104,504° "	8.
Olefiant Gas.....	11,858° "	166,012° "	14.

The meaning of this Table is simply that equal weights of water would be heated by the several gases to temperatures proportional to the numbers in the first column, when equal *weights* of the gases are burned; and proportional to those in the second column, when equal *volumes* are burned.

A cursory glance at the figures in the second column of this table might seem to justify the notion hitherto entertained by many of the comparatively low calorific powers of hydrogen and carbonic oxide; and it was doubtless as a consequence of such a comparison as this that statements have been put forth and widely accepted among American Gas Engineers to the effect that the weight of water heated from the freezing to the boiling point by one cubic foot of the four main components of illuminating gas, respectively, is as follows:

Hydrogen.....	2.22 lbs. water
Carbonic Oxide.....	2.16 " "
Marsh Gas.....	6.17 " "
Olefiant Gas.....	10.74 " "

The figures here being obviously about in the same ratio as those in the second column of Table I. Several most grave errors, however, are here involved. To get at the true relative calorific effects of the above gases, when burned in the open air, in heating water, below its boiling point, deductions must be made, not only for the *specific heats* of the products of combustion of the gas, but also, more important still, for the specific heat of the *nitrogen of the air* required to burn the gas. In fact, when we consider that for each volume of oxygen required to burn a given volume of a gas, about *four volumes* of nitrogen must be heated up to the temperature of the flame, it becomes easy to conceive, what is actually the fact, that within certain limits the waste of heat due to this cause alone counterbalances altogether the advantage that would be supposed to result from the crowding of combustible matter into so condensed a form as in the illuminating hydrocarbons. An inevitable result of our investigations of this matter, is that the heating powers of the flames of pure hydrogen and pure olefiant gas, even when used to the greatest advantage, to heat water below its boiling point, are almost or quite identical.

[The term *specific heat*, as here applied to gases, may probably receive, with advantage to some of our more practical readers, a few words of preliminary explanation. Gases, like all other bodies, differ in the amount of heat, so to speak, required to bring them to the same temperature. It is known in a general way to most persons that different *metals*, for example, differ much in this respect; and that if bars of iron, silver, and gold of the same size be put into the same fire, the iron will take about three times as long as the gold, and twice as long as the silver, to reach the same temperature. It is the same with different gases; and as the *time* occupied in the combustion is constant for all the products of combustion, the amount of heat-energy absorbed, or, in other words, the amount of diminution of the temperature of the burning mass, must differ according to the means of the specific heats of the products of combustion.]

In this discussion we have occasion to use the numbers representing the specific heats of but *three* gases, the three, namely, which remain after complete combustion, *steam*, *carbonic acid*, and *nitrogen*; as we must assume that in the hottest and most luminous zone or shell of the flame, there is no oxygen in excess to be heated. These three numbers are, according to Regnault's latest determinations, for equal weights of

Steam.....	0.4805
Carbonic acid.....	0.2163
Nitrogen.....	0.2438
(*Liquid water* being.....	1.0000)

This means that the amounts of heat which would raise one pound of water and steam *to the same degree* are in the ratio of 0.4805 for the pound of steam, and 1. for the pound of water.

CALCULATION OF THE CALORIFIC EFFECT OF HYDROGEN BURNING IN AIR.

Let us take, first, the simplest case possible, that of hydrogen with exactly the right admixture of pure oxygen to burn it, which, by Table I, develops a total heat of 34462° C.; that is, would heat a certain weight of *liquid* water to this temperature. In order to find the actual amount of heat contained in the products of combustion, we must first take into account the fact that one pound of hydrogen burns to *nine pounds* of steam, and then obtain the ratio between the above number, 34462, and the amount of heat necessary to heat nine times the weight of steam; that is, nine times the specific heat of steam. Calling the total residual heat in the produced steam x, we have the simple proportion:

$$9 \times (\text{Sp. heat of Steam} - 0.4805) : 34462 :: (\text{Sp. heat of water} - 1) : x;$$

$$\text{or, } x = \frac{34462^\circ}{4.3245} = 7969^\circ \text{ C.}^* = 14376^\circ \text{ F.};$$

* Bunsen, in his Gasometry (English edition of 1857, p. 242), gives this number as 8061° C, the difference being due to the use by him of a different number for the specific heat of steam, namely, 0.475, apparently an earlier determination of Regnault. Bunsen makes here the singular oversight of regarding this figure as the temperature, when "the gases can freely expand, as is the case in an open flame," overlooking the correction necessary in this case for the *latent heat of steam of combustion*, as is explained in the text above.

a number which, we may add, represents the *maximum* of heat capable of being imparted *to liquid water* by the flame of HARE'S oxyhydrogen blow-pipe.

Still, we have by no means here the actual temperature of the free or open flame of HARE'S blow-pipe; which is generally *lower* than this figure: as we have not yet taken into account the "latent heat," or heat of vaporization, of the 9 lbs. of steam formed. The Centigrade temperature necessary to convert 1 lb. of water into steam being 537°; to get the *actual temperature of* the oxyhydrogen flame, we must modify the above equation, so that

$$x = \frac{34462° - (9 \times 537°)}{4.3245} = 6851° \text{ C.} = 12364° \text{ F.};$$

which is the temperature actually possible in the flame of the compound blow-pipe, *were the combustion instantaneous and complete.*

When hydrogen gas burns *in air*, however, as has been before stated, another deduction of enormous amount must be made from the above figures, due to the heat required to expand the nitrogen. This is obtained simply by adding to the divisor, as above, the weight of the nitrogen of the air employed, multiplied by its specific heat. The weight of the nitrogen in air = 3.318 times the oxygen; so that the latter of the above equations becomes

$$x = \frac{34462° - (9 \times 537°)}{4.3245 + (8 \times 3.318 \times 0.2438)} = 2744.5° \text{ C.} = 4972° \text{ F.}$$

[We wish to point out that we have here a full explanation of the extraordinary rate of degradation of illuminating gas by admixture of air, which we have discussed elsewhere. The nitrogen of such air is not merely a diluent, or even a mere deductive quantity; its specific heat is an actual *divisory* function in diminishing the flame-temperature.]

This, then, is the actual temperature to which the flame of hydrogen gas burning in the atmosphere might attain to, supposing complete and instantaneous combustion. If it is desired to obtain instead, the total calorific effectiveness, as in heating water below its boiling point—in which case the latent heat of the steam of combustion becomes also available—the above expression is changed by simply omitting the subtrahend in the numerator:

$$x = \frac{34462°}{4.3245 + 6.4714} = 3192° \text{ C.} = 5778° \text{ F.}$$

CALCULATION OF THE CALORIFIC EFFECT OF CARBONIC OXIDE BURNING IN AIR.

As the product of combustion is here solely carbonic acid, no latent heat of steam enters, and the calorific effectiveness is the same, under all circumstances, in air. In the numerator we substitute of course the calorific equivalent of one volume of carbonic oxide from Table I.; and in the denominator, for the specific heat of 9 pounds of water, that of 22 pounds of carbonic acid, being the weight of the latter formed by the combustion and combination of 14 lbs. (weight of a volume of carbonic oxide on the hydrogen scale by third column of Table I.) of carbonic oxide, with 8 lbs. of oxygen. The number for the specific heat of nitrogen is the same as before; and the equation is now

$$x = \frac{33642°}{(22 \times 0.2163) + 6.47 - 11.23} = 2996° \text{ C.} = 5425° \text{ F.}$$

MARSH GAS AND OLEFIANT GAS.

In these two cases, we have as products of combustion both carbonic acid and water; and, therefore, when the calorific effects are sought for, we have not only the latent heat of steam entering as a subtrahend into the numerator; but also into the denominator, as divisors, all three of the specific heats of steam, carbonic acid, and nitrogen.

Then, as 8 lbs. of marsh gas consume 22 lbs. of oxygen, and produce 22 lbs. of carbonic acid, and 18 lbs. steam; and as 14 lbs. of olefiant gas consume 48 lbs. of oxygen, producing 44 lbs. of carbonic acid, and 18 lbs. of steam, the equations for the calorific powers of their flames in air become—

For marsh gas:

$$x = \frac{101504° - (18. \times 537)°}{(18. \times .4805) + (22. \times .2163) + (32. \times 3.318 \times .2438)} = 2414° \text{ C.} = 4386° \text{ F.}$$

And for olefiant gas:

$$x = \frac{166012° - (18 \times 537°)}{(18. \times .4805) + (41. \times .2163) + (48. \times 3.318 \times .2438)} = 2143° \text{ C.} = 4970° \text{ F.}$$

When the deduction for the latent heat of the steam of combustion is not made, the results in these two gases are considerably higher, as will be obvious from mere inspection of the formulæ.

We shall now give, in tabular form, all the results of our calculations of the calorific powers when burning in the air, of the four gases we have to deal with.

TABLE II.

For Equal Volumes of the Gases Burning in Air.	Calorific Effects in Heating Liquid Water. Centigrade Degrees.	Calorific Effects in Heating Liquid Water. Fahrenheit Degrees.	Calorific Effects, Above 100° C. Centigrade Degrees.	Calorific Effects, Above 100° C. Fahrenheit Degrees.
Hydrogen (Sp. Heat HO—.4805)	3192°	5778	2744°	4971°
Hydrogen (Sp. Heat HO—.4750)	3204°	5799°	2755°	4991°
Hydrogen (Mean)	3198°	5788°	2749°	4980°
Carbonic Oxide	2996°	5425°	2996°	5425°
Marsh Gas, (Sp. Heat HO—.4805)	2660°	4820°	2414°	4386°
Olefiant Gas, " "	2916°	5481°	2743°	4970°

COMPUTATION OF CALORIFIC EFFECTS OF MIXED GASES.

The above Table renders the calculation of the calorific effects of any given gaseous mixture, whose centesimal composition is known, a matter of extreme simplicity. It is only necessary to obtain the sum of the multiples of the percentage of each component gas into its calorific capacity, as given in this Table, and divide by 100.*

To serve as examples of these modes of computation we here cite, in tabular forms, the results of some analyses of a number of gaseous mixtures, made by us during the past winter (1868–9). [These analytical results, it may be remarked, possess points of novelty and importance, both scientific and practical, which will bring them up again hereafter, in other connections. They are here placed on record.]

Table III. gives the results of two analyses of gaseous mixtures obtained by passing steam *superheated to incandescence* upwards through a mass of *anthracite coal* heated to a high degree in a clay retort of a novel construction, according to what is now known as the "GWYNNE-HARRIS," or AMERICAN HYDROCARBON GAS SYSTEM. In this table the results are calculated without carbonic acid and sulphuretted hydrogen, which, with traces of nitrogen and sometimes of oxygen, are found in the unpurified anthracite gas.

TABLE III.

Analyses of Anthracite Hydrocarbon Gas; by SILLIMAN *and* WURTZ.

	No. 1.	No. 2.	Mean.
Hydrogen	60.43	59.32	59.87
Carbonic Oxide	35.44	37.14	36.29
Marsh Gas	4.13	3.54	3.84
	100·00	100.00	100.00

In Table IV. column 1 gives the results of the analysis of the street gas served out at this period by the New Haven Gas-Light Company; made from Westmoreland coal enriched with about six per cent. of Albertite. Column 2, the mean of four analyses of the completed hydrocarbon gas made by us at Fair Haven during the same time, by combining gas from the same Westmoreland coal (with 10 per cent. of Albertite) with half its volume of the Anthracite gas. Columns 3 and 4 are obtained from 1 and 2 by centesimal reduction, after deduction of the illuminant ingredients, being what we propose to designate as the non-illuminating *substrata* of illuminating gases.

TABLE IV.

GAS ANALYSES—BY SILLIMAN AND WURTZ.

	(1). New Haven City Gas.	(2). Fair Haven Hydrocarbon Gas.	(3). Substratum of New Haven Gas	(4). Substratum of Fair Haven Gas
HYDROGEN	43.58	46.77	46.79	50.27
CARB. OXIDE	2.14	9.56	2.31	10.27
MARSH GAS	47.42	36.71	50.90	39.46
ILLUMINANTS	6.86	6.96		
	100.00	100.00	100.00	100.00

Table V. gives the results of the computation, from our *formulæ*, of the calorific powers of these five gaseous mixtures, for communicating temperatures both above and below that of aqueous ebullition. We should remark that we have here been obliged to regard the volumes of *illuminant hydrocarbons* as representing olefiant gas solely; both because we have no certain data as to their real nature, and particularly because, if we actually knew, or should assume, the nature of the hydrocarbon vapors present, still we have no experimental calorific equivalents, as we have for olefiant gas, from which to start, in such a computation. We have reason to believe nevertheless that the errors thus introduced are not important in amount.

TABLE V.

	Weights of Water Equally Heated Below Boiling; by Equal Volumes.	Weights of Water Equally Heated Above Boiling; by Equal Volumes.	First Column Reduced to New Haven Gas=100.	Second Column Reduced to New Haven Gas=100.
Anthracite Gas	3100	2828	104.2	109.2
Substratum of the New Haven Street Gas	2917	2581	98.1	99.6
Substratum of the Fair Haven Hydrocarbon Gas	2962	2640	99.6	102.0
New Haven Gas; with the Illuminants assumed = Olefiant	2974	2592	100.0	100.0
Fair Haven Gas; with the Illuminants assumed = Olefiant	2959	2647	99.5	102.1

CONCLUSIONS.

Some of the practical conclusions to which we are of necessity compelled, by the results of the above investigations, are somewhat remarkable, so that we feel diffident regarding them. It is however always safe to follow the leading of Truth, however astray she may conduct us from our preconceived notions.

From Table II. it is apparent:

1. That of all known gases, the highest calorific effects, under ordinary atmospheric conditions, are obtainable from *carbonic oxide;* whose calorific value, above 100° C., is about 3000° C.

2. That in absolute calorific value, below 100° C., in the atmospheric medium, *hydrogen* surpasses its volume of any other gas; giving a temperature of about 3,200 C°.

3. That for all modes of application—that is, for producing both high and low temperatures—the total maximum calorific effectiveness of carbonic oxide is a *constant quantity.**

* Prof. BUNSEN, in the masterly discussion of the subject, presented in his *Gasometry*, not having in view the exact object we propose, has used a train of reasoning and a mode of formulation of some complexity, to follow which requires some little mathematical skill—part of his objects having been to construct a *formula* so general and comprehensive as to cover the direct computation, from any gaseous mixture independently, of its special calorific intensity. We have here aimed at so simplifying as to bring the whole subject within the capacity of all. Our above tabulation of the individual gaseous components, as a starting point, seems to us to accomplish this most effectually, so far as illuminating gases are concerned.

* Metallurgists, especially, will appreciate the suggestive import of the truths presented under the first and third heads; here enunciated, as we think, for the first time. It is to be noted that all the above effects belong to the *maximum* kind, and, of course,

4. Compound condensed submultiple volumes of hydrogen, like that in marsh gas, have much *less* total calorific value in air than their volume of free hydrogen.

5. Condensed compound submultiple volumes of gaseous carbon, like that in olefiant gas, have no greater total calorific value, in air, below 100° C., than their own volume of carbon gas in the form of carbonic oxide; while above 100 C°. their value is even considerably less.

reach their development only under the most favorable conditions in each case respectively.

The Pneumatic Railway in New York.

The tunneling for this work is steadily going on. A decision has been made as noted below in the action brought by the city against the company in which an injunction against the work was asked for. The tunnel extends at present from the corner of Warren street, (Devlin's clothing store) under Broadway southward to a point half way between Murray and Barclay streets. The inside of the tunnel, which is painted white and is brilliantly lighted with gas, is of brick, circular in form 8 feet in diameter, at the upper end. The vault is quite spacious. Light is obtained by means of glass inserted in the sidewalk above. An attractive finish is given to the walls by a wainscoting of oak and walnut in stripes. A railway runs upon the floor of the tube, which is twenty-one feet from the surface of the street. It is used for conveying the earth towards the entrance as the tunnel proceeds. Upon this road stands a long passenger car, which is used for this purpose. It can be fitted with seats, if necessary, for experimental trips. The mode of excavation is thus described: In the office of the company, in the basement of Devlin's building, is a large iron cylinder for the working of the fan which is to propel the car. The upper half only of this cylinder is visible above the floor. Adjoining the office is the engine-room, where stands a boiler and an engine of eighty-five horse power. The tunnel is gradually lengthening, at the rate of four feet a day, but, from the circumscribed space, only two men are able to shovel the earth that falls through the action of the rams. At this rate progress would be necessarily slow, and many years might elapse before the work could be finished through the length of New York island. The plan of the company, however, is to sink shafts and carry on operations at numerous points along the line. The rapid completion of the undertaking will therefore be more a question of capital than of time. The public will soon be admitted to view the tunnel and ride in the car. There is but little doubt on the part of the company that abundant funds will be obtainable when the practical working of the tunnel has been demonstrated. The design, on the completion of the tunnel, is to run the car at the rate of one mile in a minute. This cannot be done at present. The distance is too short for quick stoppages. The charter of the company at present permits only the carriage of freight; but as passengers can be transported with equal facility, it is expected that it will be amended for that purpose.

The President of the tunnel company, the corporate name of which is the Beach Pneumatic Transit Company, is one of the proprietors of the *Scientific American*. A writer in the current issue of that journal describes a visit to the tunnel made on the 8th instant. He says: "The day was stormy and the snow fell fast and heavy. Cars were with difficulty kept on the tracks in the streets. Umbrellas were in vain. The wind made no more of turning them inside out, than of shaking dead leaves from the trees in the park. It was a favorable time to contrast the miseries and annoyances of street car travel with the comfort of tunnel transit.

"Entering at the south-west corner of Warren street and Broadway, we were soon initiated into the mysteries of which so much has been made by the newspaper reporters. The simplicity of the principle of this mode of transit is not fully appreciated until one sees the thing itself.

"Let the reader imagine a cylinderical tube eight feet in the clear, bricked up and whitewashed, neat, clean, dry, and quiet. Along the bottom of this tube is laid a railway track, and on this track runs a spacious car, richly upholstered, well lighted, with plenty of space for entrance and exit. The whole arrangement is as comfortable and as cosy as the front basement dining-room of a first-class city residence. The tunnel has not only the positive comforts described, but it is absolutely free from the discomforts of surface car-travel. The track is smooth and level, and not being subjected to incessant battering from heavy trucks, is easily kept in first rate condition. It is not cold in winter. It will be delightfully cool in summer; the air will be constantly changed in it by the action of the blowing engine. The filthy, health-destroying patience-killing street dust, of which up-town residents get not only their fill, but more than their fill—so that it runs over and collects on their hats and clothes; fills their hair, beards, and eyes, and floats in their breaths like the vapor on a frosty morning—will never be found in the tunnel. Add to these advantages that of cheap, rapid, and uninterrupted transit, free from the dangers of collision with loaded trucks, and we have a pretty fair showing in favor of the tunnel over street railways.

"When the tunnel is opened to the public it will be no dirty hole in the ground the people will be invited to enter, but a handsome subterranean avenue, through which they may be rapidly transported to their homes up town.

"This system is in our opinion vastly superior to subterranean steam transit under Broadway, as has been proposed. Its first cost is very much less. It is free from the smoke-nuisance and from the dust of locomotives. There can be no accumulation of carbonic acid gas in it, an evil which may be estimated from the fact that for every pound of coal burned, three and one third pounds, or twenty-nine and one half cubic feet of carbonic acid will be generated. Granted that this gas will find free exit from the area ways, at the side of the street, so that people can breathe and live below, it will float off into the stores alongside, descend into the cellars and become a general nuisance.

"In the pneumatic system, the cars will be impelled by compressed air only. This air will be uncontaminated by gas or dust, the track will not be crushed and damaged by heavy locomotives, and all the discomforts of steam travel through tunnels will be eliminated.

"The present apparatus in the basement of the building at the corner of Warren street and Broadway, comprises a stationary engine of one hundred-horse power, with boiler, and a Root's pressure blowing engine, capable of delivering to the tunnel one hundred thousand cubic feet of air per minute. We may on a future occasion give a more detailed account of this apparatus.

"There is no doubt that this method of transit might be made not only the means of easy and rapid communication between the upper and lower parts of the island, but also between New York and Long Island, and New York and New Jersey, through tubes underneath the North and East rivers. The relief which this would give to surface taavel and the convenience it would afford to suburban residents, would increase the value of real estate, and greatly add to the comfort and luxury of metropoliton life."

Judge Cardoza, since the above was written, gave his opinion in the case in which the city seeks to restrain the building of the tunnel. He holds that the defendents are doing nothing which, under the acts of the legislature, they have not the right to do, and that under the decision in The People *vs.* Kerr, or the *dicta* in those cases not to be too closely scrutinized at Special Term, the acts are not unconstitutional. He adds that if he did not regard the case as clear, he should be inclined to hold that an injunction should not be issued until the question had been passed upon by the General Term, because the defendants had incurred large expenses, and the plaintiffs had suffered them to do so without any objection.—*Stockholder.*

Difference of Time.—When it is 12 o'clock at noon in New York City, it is forenoon at all places west of New York, and afternoon at all places east, according to the following table:

	A. M.
Philadelphia	11 55 52
Buffalo, N. Y	11 56 32
Charleston, S. C	11 36 40
Cincinnati, O	11 16 18
New Orleans, La	10 55 46
Oregon City	8 46 40
Honolulu, Sandwich Islands	6 24 08
Quebec	12 28 06
St. Helena	4 33 40
London, England	4 55 42
Rome, Italy	5 46 03
Jerusalem	7 17 24
Calcutta	10 49 56
Montreal	12 01 44

The difference between Trinity Bay and Valentia Bay is about 2 hours and 48 minutes.—*The Old Franklin Almanac for* 1870.

Fifteen millions three hundred and thirty-seven thousand feet of gas have been manufactured in Camden N. J., during the year 1869, and the entire amount of main gas pipes laid in the streets is seventeen miles. Consumers 1,300. The total number of lamps in Camden, N. J., for lighting the streets is 256. In North Ward, 113; in Middle Ward, 89; South Ward, 54. These are now entirely under the supervision of the Gas-Light Company, according to contract.

The Mode of Testing Mineral Oils used for Lamps.

By Benjamin H. Paul., Ph.D.

[From the London Chemical News, Jan. 7, 1870.]

The degree of inflammability of the mineral oil now used for lamps is a character which the chemist is sometimes called upon to determine; and since recent enquiries appear to indicate that there is considerable difference of opinion as to the mode in which mineral oil should be tested for the purpose of determining that character, I have thought that this subject, though not one of any scientific interest, would be worth bringing under the notice of the readers of the Chemical News, especially since the degree of inflammability of mineral oil is now attracting considerable attention, in reference to the question of danger attending the use of such oil in lamps.

All kinds of mineral oil, whether derived from coal, or bituminous shale, or from petroleum, are, by their nature, more inflamable than the fat oils, such as sperm oil and colza oil, formerly used for lamps, that is to say, they take fire more readily and at a lower temperature than the latter; they also differ from those oils in being partially volatile at a temperature which has no similar effect upon the fat oils. Since the vapor thus given off is inflammable, and when mixed with the air in due proportion, capable of exploding, it is evident that the use of any kind of hydro-carbon oil requires, for both the reasons just mentioned, a greater degree of care than is necessary in the use of fat oils.

In considering the question of danger to be apprehended from the use of mineral oil in lamps, the conditions under which it is used in a general way must be taken into account; and so far as the inflammability of the oil is concerned, the point to ascertain is not merely what oil may be used without any necessary danger, but what kind of oil will answer the purpose for which it is required as an illuminating material without, at the same time, requiring any greater degree of caution in its use than can fairly be expected under the circumstances. Even the more volatile portions of petroleum and paraffiin oil, constituting what is generally termed "spirit," or naphtha, benzoline, ligroine, etc., may be burnt without any necessary danger in some of the ordinary paraffin lamps, which are constructed in such a manner that there is no free communication between the flame and the oil reservoir. But this material, which begins to boil below 100° F., and distils over completely below 300° F., while it is readily volatilised at the ordinary atmospheric temperature by contact with air, is much too volatile for general use in that way, except in the special form of lamp known as the "sponge lamp;" and, for that reason, it can scarcely be regarded as a suitable material for burning in what is termed the paraffin oil lamp. The fact that it can be used in this way serves merely to show that any danger attending the use of mineral oil in lamps is less referable to its volatility and greater inflammability, as compared with fat oils, than it is to carelessness, or misuse, and the neglect of those precautions which the nature of this material renders indispensible. But, though the possibility of improper usage cannot reasonably be regarded as justifying any considerable restrictions in the application of a material so useful as mineral oil, still some allowance requires to be made for it; and since, in this respect, the degree of inflammability is the character of the greatest importance, it is customary, in the operation of refining, to seperate and exclude from the oil to be used for ordinary lamps, a certain amount of the more volatile hydrocarbons contained in the crude petroleum or paraffin oil. The extent to which this is done is not in all cases the same, and there is some difference of opinion as to what should be the minimum degree of inflammability of the oil, or the minimum temperature at which it should be capable of giving off inflammable vapour, in order to ensure for it such a degree of safety as would be consistent with the general circumstances under which it is used in lamps and kept as a commodity in shops. By some, it is considered that when a flame is brought into actual contact with the oil, heated in open capsule, it ought not to take fire, so as to continue burning, until the temperature reaches 130° F. Others, again consider that, if it does not take fire at a temperature below 100° F., it is of a character fit to meet all requirements.

Hitherto, far less attention has been paid to the degree of inflammability of mineral oil than to the absence of smell and color. It has also been customary in different countries to use oil differing widely in regard to the temperature, at which it would take fire. Some years ago, the oil generally consumed in this country had a very high firing point, and it was customary to test it by observing how long it would bear contact with the flame of a match without taking fire, or more accurately by observing the temperature at

which it took fire and continued to burn. This temperature was generally from 120° to 130° F., and sometimes it was high at 150° F. The oils manufactured about eight years ago, from Rangoon petroleum, and from coal and bituminous shale, were of this kind. On the Continent, oil inflammable at a much lower temperature has generally been preferred.

After the introduction of American petroleum, there was a marked difference in the character of the imported lamp oil manufactured from this material, so far as regards the degree of inflammability, and it would often take fire at a temperature little above 100°. During the last three years, the firing point of this oil has been still further reduced, and probably the greater part of the lamp oil imported from America and made from petroleum, which has been consumed during that period has had a firing point below 100° F., sometimes considerably lower.

In addition to the differences, both of opinion and practice in regard to the degree of inflammability of mineral lamp oil, there are also similar differences as to the mode of determining this character, and as to what is to be regarded as the firing point.

This oil being in all cases a mixture of several hydrocarbons belonging to the paraffin series chiefly, and varying in their boiling points from about 200° to upwards of 700° F., the temperature at which it begins to give off vapour will depend upon the boiling points of the more volatile hydrocarbons, and upon the amount of them contained in the oil. Consequently, when the oil is gradually heated in contact with air, and a flame is brought near the surface from time to time, there is always a little momentary flash, produced by the vapor taking fire; and this happens some time before the oil attains the temperature at which it takes fire itself, and continues to burn. The difference between the temperature at which the temporary flash takes place, and that at which the oil takes fire, will amount to from 10 to 20 degrees Fahrenheit,

Upon the assumption that an explosive mixture of oil vapor and air may be formed within the reservoir of a lamp, it has been urged that the temperature of the oil when this tempory flash takes place should be considered as the firing point of the oil.

[To be continued.]

Method of Giving a Good Face to Bronze.

The oxidation of statues and other articles in bronze has always been a matter of uncertainty, while the changes which take place in the appearance of such works either greatly improve or deteriorate works of art. Many bronzes exposed to the action of the air of towns frequently assume an unpleasant blackness, which makes them resemble cast-iron rather than bronze. The Berlin Society for the Encouragement of Industry has, during the last five years, made many experiments in the oxidation of bronze. An immense number of experiments have been made on oxidized coins and other objects, and one fact said to be arrived at is that the composition of the metal has little to do with the color of the oxidation. It has been observed, at the same time, that in the case of public monuments in bronze those parts which were within reach of the public fingers became admirably colored, while the other portions became black and unsightly, hence the idea that the *patin*, as the French call this oxidation, was the result of *patinage*, or, in plain English, pawing, an inference very difficult to admit in many cases. However, following this indication, experiments have been made for some years with bronze busts placed in the open air, and it has been found that those which were washed daily became of an unsightly dark color, while others which were oiled once a month, the oil being simply wiped off with a woollen rag, became of a magnificent tone.—*Morgan's Brit. Trade Journal.*

Oxygen Gas for Public Use.—Oxygen gas is now produced on a large scale commercially in Paris. Carts with metal reservoirs containing the compressed gas may be seen in the streets for the supply of consumers. The Galeté Theatre is one of the largest consumers the outside being illuminated every night by the oxy-hydrogen light, cylinders of magnesia or zirconia taking the place of those of lime, as ordinarily used for this purpose. The light is interspersed among the gas jets with good effect. In the interior the scenes owe many of their effects to the use of this light. The oxy-hydrogen light is also used largely for the production of the illuminated advertisements now so common in the Boulevards and other places. These are produced by a magic lantern and screen on the second floors, and the parties undertaking the display of these advertisements are large consumers of the oxygen gas.

Correspondence.

[Correspondents in all cases should sign their communications with their names and address in full, not necessarily for publication, but as a guarantee of good faith.—Eds.]

Experimenting With Hydrogen Gas.

PHILADELPHIA, February 8, 1870.

Messrs. Editors: I am experimenting on the manufacture of Hydrogen Gas, and find, after using nearly 100 lbs. of sulphuric acid within the past month, that the machine is perfectly clean at the bottom. I think the sulphate is held in solution, and would like to know if I am correct; and if so, what means can I make use of to cause it to precipitate. Please answer through the columns of your valuable Journal, and greatly oblige,

CHARLES JONES.

P. S.—My charge for the machine is 20 lbs. acid, 100 lbs. water, 30 lbs. iron. C. J.

A Contradiction.

PHILADELPHIA, Feb. 14, 1870.

Messrs. Editors: We notice a correspondence in the Journal of the 2nd inst, about the Gas Works at Englewood, N. J., and as it states there are some leaks in the mains, we deem it proper that we should state that we *did not furnish the mains, neither did we lay them*, we *furnished and erected the works only*; they are free from leaks, as a letter from the superintendent to us states. Our part of the works, we believe, gives entire satisfaction.

Respectfully,

MORRIS TASKER & Co.

Iron versus Clay Gas Retorts.

Messrs. Editors: Having read in your paper the communication regarding Gas Retorts, I beg to inform you that I am selling clay retorts in this country, which are certified by managers here, to be the *best they have ever* used; also that in some cases they have lasted four times as long as iron retorts; and again that "they have been in use for *five years*, and likely to last for some years to come."

Any desire to know more on the subject, can be gratified by communicating with P. A. Perrin, Esq., 273 Pearl Street, New York.

Your obedient servant,

Scott Siddons.

Answer to John Keeling.

ROCKFORD GAS-LIGHT AND COKE CO.,
ROCKFORD, ILL., Feb. 9, 1870.

Messrs. Editors: Enclosed you have my subscription for 1870. One of your correspondents in your issue of February 2nd states "that a retort is stronger when in use without exhauster than with, and that the yield of gas is as good, and the quality more uniform." Now I cannot allow such a statement to pass unnoticed, for if such is the fact, I can truly say my conscience is very much relieved, for I have been troubled considerably to think of the amount of iron and coal that I have butchered, as you may say, before I got an Exhauster. Oh, it is horrible to think of the money paid out to convince some folks to leave the beaten path. My consumers would not like me to put out my Exhauster, neither would my men; and as to my own experience (of more years than your correspondent) I think the fact of having my consumers express openly their satisfaction with the quality of gas, and having got rid of paying $90 per ton per retorts to run ten months, and then sell them for $6 per ton, is enough to convince me of the value of an Exhauster. As to running it below zero, I have my compensators set to half inch pressure, and if any man down in Connecticut allows any hole to be drilled in connection before reaching the Exhauster, he is qualifying himself for a certain place much lower *down*. In time to come I regard the Exhausters as adding 50 per cent. to the capacity of small works, if properly run; not that the yield is that amount more, but the making powers of the works. As to quality there is no comparison. Yours truly,

THOS. BUTTERWORTH, Pres't.

Experience of a Gas Engineer.

ENGLEWOOD, N. J., Feb. 21, 1870.

Messrs. Editors: In my communication to you of January 25th, I closed for want of further space; I stated that if acceptable I would send the balance of what I had to say. Not being aware that you had accepted it until I saw your last issue, I now send the remainder to make it more complete.

I found that although I used lime sufficient for purification, the gas would not stand the test papers. I took off the centre seal cover and found, as I expected, a communication between the partition of the valve; I repaired the same and removed the trouble. Next I found that the meter gave evidence of a sufficiency of water, when for weeks none was put in. I took out the upper cock of the water guage and found it stopped up, thereby preventing the gas from pressing on the water in the tube, and showing a fictitious level. Again, I would make plenty of gas, but the meter would not register any. I took out the works and found one of the pinions loose; I screwed it in its place, oiled the works, and started again. The condenser pipes (vertical), I think twelve in all, had each a piece of one-inch tube screwed in the bottom, with a stop cock to each; they required a great deal of attention, as well as a frequent renewal of the cocks mentioned. I had a trough or tank made of two-inch plank and 18 inches deep, long enough to admit the whole of the drip pipes. I then took away the cocks and let all the pipes dip into the tank, and scald them with water as the hydraulic main; they were then self acting, and from time to time as the tank became filled I drew off the tar from a stop cock at the end; the purifiers would at times "blow" and yet the gas be pure; by changing them the annoyance would cease. The stand, or rising pipe on the mouth piece on one occasion became stopped; I cleared it out, and ever after I occasionally ran a small rod up the pipe and by that means kept it clean. In securing the mouth-piece to the retort I adopt this method (simple and original); I put all the bolts in but do not screw them up, then take some rope yarn and put in the space between the mouth-piece and retort, on the outside, and letting it rest on the bolts; I then fill the inside with iron cement and screw up. During the war, the company by whom I was employed were paying sixty cents per bushel for lime for purifying purposes. I put up a small kiln, made of sheet iron (circular), six feet high and four feet diameter, lined inside with common brick, and made the lime from oyster shells, at a cost of not more than five cents per bushel.

These little things, Mr. Editor, are simple enough to the practical engineer, but are somewhat mysterious to the new beginner. Respectfully yours,

THOMAS T. TASKER.

A Word in Favor of Clay Retorts.

QUEBEC GAS WORKS, Feb. 24, 1870.

Messrs. Editors: Having observed the Report of the Northern Liberty Gas-Light Company in your Journal of the 3rd inst., and your remarks upon the same with regard to fire-clay retorts, allow me to state that for more than a quarter of a century I have used clay retorts, and I never had any cause to regret it during that time. I have had them working for four years, the furnaces only requiring to be renewed.

The general length of my retorts are twenty feet, set in benches of threes and fives, with a furnace at each end 9 x 36 inches. Some of these retorts have been in actual service thirty-four months, and are as good this day as when they were first set. I never think of any of them becoming unserviceable under three years constant work. As to the arches none of them have given away for the last twenty years. If the company's manager would test the clay and bricks before purchasing them, he would save much trouble and expense.

By a careful selection of these materials and proper care in working the retorts, they would never dream of returning to iron ones, which, with the utmost care, will not last more than twelve months, and not even eight with hard work.

As to the collection of carbon, there must be some neglect in the working of the retorts; either the pressure on them must be excessive, or the coals very damp. If the coals are under cover and quite dry, there will be very little cause for trouble with the carbon.

Excuse me, Messrs. Editors, I would not have written so much had it not been for the sweeping condemnation of the clay retorts. Yours truly,

P. PEEBLES.

Electro-Heating Apparatus.

An invention for heating purposes, patented March 12, 1869, is based upon the well-known fact that electricity, in passing through a conductor of insufficient capacity (such, for instance, as a wire of very small diameter), evolves or develops heat. It is also well known that a wire of any great length, and of sufficiently small size to evolve considerable heat, will not conduct a strong current of electricity without difficulty and loss, and that as the wire becomes heated, its non-conductivity is increased, and that, in consequence, the heat becomes so great the wire will be fused.

The object of the invention is to obviate this difficulty, by enabling a strong current of electricity to pass through a heat evolving apparatus of any length; and to this end it consists in providing an electrical conducting coil, or chain, with intervals of small conducting power, in traversing which the electricity will be caused to evolve heat; and further, in interposing between said obstructing intervals, free conductors of much larger size, which constitute reservoirs of electricity, and radiaters of heat, and will effectually obviate the difficulty experienced in a continuous length of conductor of insufficient capacity.

In the application of the invention, for railway carriages or cars, it is proposed to employ magneto-electric machines, constructed especially for this purpose, for producing the requisite current, placed, if necessary, under the car, and to obtain the power to operate them from the axle of the car—thus taking advantage of a motive power which already exists, but of which, heretofore, no use had been made.

A machine capable of heating to incandescence one foot of platinum wire one-tenth of an inch diameter, will heat one hundred feet one hundredth of an inch; two hundred feet, two hundredths of an inch, etc.; the law being that the lengths of the wires vary inversely in proportion to the squares of their diameters. Now to reduce this to practice, it will be seen that a machine or battery of the power above referred to will heat a length of coil or chain, in which the aggregate length of the small wire of one-hundredth of an inch diameter, forming the obstructions is one hundred feet; and two hundred feet, if their diameters are reduced one half, etc. In other words, having a machine of a certain power and a certain degree of heat is required, the diameters of the obstructing media may be reduced or increased in order to accommodate them to the power of the machine.

In order to warm an American car upon this plan, allowing for a tray placed in the floor of the car, in front of each seat, it is estimated it would require an entire length of chain or coil of about three hundred and sixty feet, and in which the obstructing media form an aggregate length of about seventy feet; so that to accomplish this it would require a machine to heat this latter number of feet of small wire.—*Journal of the Telegraph.*

New Facts About the Manufacture of Illuminating Gas from Mineral Oils.

The *Deutsch Industrie-zeitung* communicates some interesting facts on the above topic, they being taken from a report of the gas inspector, Herr Mehlis, to the Association for the advancement of the mineral oil industry in Halle upon the Saale. The experiments undertaken have proved in the first place that the value of the oils, for the purpose referred to, depends upon the quantity of the paraffine they contain. The larger the percentage of the latter, the greater the yield, and the better the quality. Still no essential factor for the valuation of the gas could be discovered either in the specific weight or in the degree of purity of the product; no much, however, has been ascertained, that the residue in the retort increases proportionally with the specific weight of the gas, and the quantity of the products of condensation with the boiling point. No definite conclusions have as yet been arrived at as to the most proper form of retorts, but the committee by which the experiments were conducted, is of the opinion that a cylindrical shape is to be preferred to any other, on account of the fact that the otherwise expensive repairs of the parts of iron are mostly avoided. No essential difference between the round and oval retorts could be ascertained. The use of pipes of decomposition is recommendable in so far as they enable the production of a certain quantity of gas with less fornaces. In regard to the temperature, a dark cherry-red heat was in all instances found most convenient.

The illuminating gas from mineral oils distinguishes itself, as well known, by its richness in carbon, a great density and high luminosity; but, as the high cost of production of this gas can only be lessened by a proportionally high luminosity it is above all necessary to select such burners and apply such a pressure as will develop the maximum of illuminating power. With regard to the application of different burners, it was found that gas which was prepared from one and the same oil yielded between 3·8 to 10·4 units of light per cubic foot; but with proper burners, the gas from mineral oils yields four times greater luminosity than ordinary gas, and, with regard to the construction of the apparatus, although they may be yet subject to many alterations, it can be said to have arrived at a point where the erection of larger works may be unreservedly commended. The city of Zeitz has, in fact, already made the necessary alterations in its gas works, in order to be able to produce the new gas, at least during the summer months. The crude material is paraffine oil, as obtained in the distillation of shales, 1000 cubic feet of gas being obtained from one barrel, which is got at the price of 2½ Prussian thalers. The cost of production of this quantity is stated to amount only to 4⅔ thalers, while this volume is disposed of at 12 thalers.

Recent American Patents.

Pertaining to Gas, Water. Etc., from the 5th to the 26th February, 1870.

99,081.—Still for Hydrocarbons and other Substances.—John Gracie, Pittsburgh, Pa.

99,082.—Portable Lubricator.—Henry Hammond, Hartford, Conn.

99,153.—Steam Generating Heater.—C. A. Buttles, Milwaukee, Wis.

99,220.—Steam Engine Governor Cut-Off.—George Milbank, Chillicothe, Mo. Antedated Jan. 14, 1870.

99,234.—Low Water Indicator and Feed-Water Regulator.—Robert Berryman, Philadelphia, Pa.

99,272.—Spiral Current Water Wheels.—John Zimmerman, Owatonna, Minn.

99,274.—Apparatus for Carbureting Air.—James F. Spence, Brooklyn, N. Y., and Lovious D. Towsley, Newark, N. J.

99,285.—Gas Meter.—Thomas Bratton, Birkenhead, Eng., assignor to A. H. Dixson.

99,307.—Apparatus for Raising Water.—J. L. Garlington, Snapping Shoals, Ga.

99,313.—Water Elevator.—W. G. Hamilton, Milton, Wis.

99,324.—Composition for the Manufacture of Water, Gas, and Drain Pipes.—W. P. Kirkland, San Francisco, Cal.

99,374.—Water Wheel.—B. W. Tuttle, Galena, Ill.

99,456.—Metallurgic Furnace.—James Montgomery, Sing Sing, N. Y.

99,500.—Manufacture of Oils from Petroleum.—Charles Torpan, Wakefield, Mass.

99,532.—Water Wheel.—Ira Carter, Champlain, N. Y.

99,548.—Turbine Water Wheel.—J. J. Faulkner, McMinnville, Tenn.

99,554.—Gas Producing Furnace.—Wm. Gerhardt, New York City, assignor to himself, Thos. Daffin, and Thos. Banes, Philidelphia, Pa.

99,569.—Water Wheel.—G. A. Houston, Beloit, Wis.

99,573.—Feed-Water Heater for Steam Generators.—E. B. Johnson, Chicago, Ill.

99,627.—Packing for Steam Engines, Pumps, etc.—Wm. Beschke, Philadelphia, Pa.

99,688.—Vapor Burner.—J. C. Love, Philadelphia, Pa.

99,689.—Vapor Burner.—J. C. Love, Philadelphia, Pa.

99,727.—Automatic Water Cut-Off.—D. F. Sweet, (assignor to himself and L. A. Leighton), Osetgo, Mich.

98,728.—Process of Treating Petroleum.—J. A. Tatro, Hartford, Conn.

99,733.—Expelling Volatile Matter from Peat and other Materials.—T. G. Walker, New York City.

99,734.—Water Elevator.—B. Wieland, Oneco, Ill., and D. S. Young, Monroe, Wis.

99,738.—Artificial Fuel.—Henry Wurtz, (assignor to J. L. Graham), New York City.

99,740.—Preparing Anhydrous Grahamite.—H. Wurtz, (assignor to J. L. Graham), New York City.

99,741.—Chemical Product called Fused or Anhydrous Grahamite.—Henry Wurtz (assignor to J. L. Graham), New York City.

99,855.—Steam Engine.—J. E. Culver, Hudson, N. J.

99,878.—Vapor Burner.—B. D. Greene, Sturgis, Mich.

99,894.—Lubricator.—Timothy Holland, New York city.

99,901.—Attachment for Lamp Chimneys.—J. Hughes, New Berne, N. C.

99,908.—Reflector for Lamps.—Fred. Judson, Casleton, N. Y.

96,909.—Water Meter.—Jos. F. Kelley, Washington, D. C.

99,927.—Apparatus for Generating Gas for Head-Lights.—H. S. Maxim (assignor to Rodley McAlister & Co.), New York city.

99,943.—Stop Valve for Steam and other Machinery.—S. J. Peet, New York city.

99,593.—Steam Pumping Machine.—Wm. F. Roberts, Mauch Chunk, Pa.

99,972.—Automatic Heat Regulator for Hot Air Furnaces.—A. H. Tingley, Providence, R. I.

99,975.—Manufacture of Paraffine and Paraffine Oil.—H. W. C. Tweddle, Pittsburgh, Pa.

99,996.—Low Water Indicator.—Robert Berryman, Philadelphia, Pa. Antedated Aug. 16, 1869.

99,998.—Circulating Tube for Steam Generators.—J. C. Stevens, South Norwalk, Conn.

REISSUES.

3,823.—Stop Valve.—J. H. Davis, Allegheny City, Pa.—Patent No. 85,288. dated Aug. 3. 1869.

3,824.—Cement Water Pipe.—Edwin Dayton, Meriden Conn.—Patent No. 77,465. dated May 5. 1868.

3,828.—Pneumatic Pump.—W. H. Guild, Williamsburg, N. Y.—Patent No. 51,175. dated Nov. 28. 1865.

"Dunbar's Gas Retort Setters Guide,"

The following subscribers to the above work is acknowledged, making 21:

Edmund Smith, Hamburgh, Germany.
J. S. Fancher, Amsterdam, N. Y.
James Dunbar, Wilmington, N. C.

MISCELLANEA.

Professor Aggassiz will soon sail in the United States survey steamer Bibb, for Florida, where he will enrich his invalnuble collection of marine specimens.

A couple of American miners have been prospecting in Lapland, and have discovered gold in considerable quantities. One of the nuggets found weighed ten ounces.

Most people in cleaning lamp chimneys, use either a brush made of bristles twisted into a wire, or a rag on the point of scissors. Both of these are bad; for without great care, the wire or scissors will scratch the glass as a diamond does, which, under the expansive power of heat soon breaks, as all scratched glass will. If you want a neat little thing that costs nothing, and will save half your glass, tie a piece of soft sponge the size of your chimney to a pine stick.

The East River Bridge.—The work on the East river bridge is progressing and is begining to attract considerable attention. Dredging machines are at work upon the foundation, and it has been found necessary to resort to submarine blasting to remove some large rocks which have been met with in sinking the bed. The powder, after being sunk, is exploded by a galvanic battery. It is expected that the caissons will be completed about the 18th of March, when they will be launched.

Danger from Dust.—Everybody knows that dust is constantly floating about in the atmosphere and being inhaled. But Prof. Tyndall makes the unpleasant announcement that this dust is charged with organic matter, and in cases of infectious complaints becomes the medium for conveying disease from one person to another. The great thing, therefore, to check the spread of infection, is to prevent these germs of disease passing into the lungs, and the Professor strongly recommends for this purpose the use of cotton-wool respirators, when exposed to the exhalations of diseased people.

The following named gentlemen have been elected Directors of the People's Gas-Light Company: W. H. Halstead (President), M. H. Bloodgood, J. D. Hayback (Treasurer), F. Cromwell, E. Hawley, G. N. Curtis, Alexander McCue, S. S. Powell, J. Sprague. The capital stock, amounting to $1,000,000, has all been paid up. The new company start with a territory that insures the stockholders dividends from the start, and is located in a district that is rapidly increasing in population. By an arrangement with the Brooklyn Gas Light Company, the new Company are supplied with gas at cost until the completion of their works, which will be finished in May. The managers of the Company are prominent citizens, and the stock in the main has been taken by capitalists of Brooklyn and New York.

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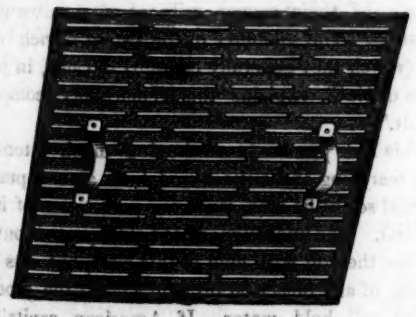

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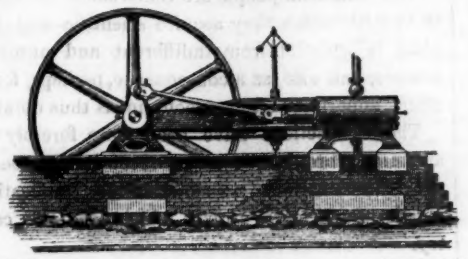

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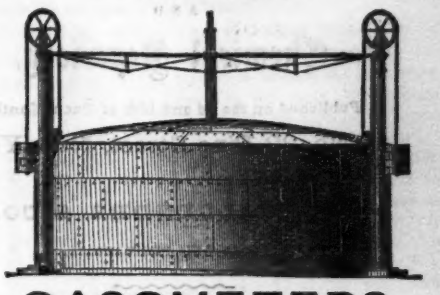

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PROFESSOR HENRY WURTZ.

[NOTE BY PROFESSOR WURTZ.—Contributions and items for which I am, as a Scientist, individually responsible, will have attached my full name or initials.—H. W.]

WEDNESDAY, MARCH 2, 1869.

WISHING TO MAKE this Journal an organ of intelligent discussion to those of our readers who may wish to gain or give information on the subjects to which its columns are devoted, the publishers solicit letters from all among them who make the study of these subjects a pleasure, or a profession.

Subscribers would confer a favor upon us by remitting *CHECKS* or *POST OFFICE MONEY ORDERS*, as we are frequent losers where money is enclosed in letters.

☞ NEWS AGENCY.—The American News Company, 119 and 121 Nassau street, New York, are agents for this Journal. Newsdealers will please send orders to them.

NOTICE.

☞ *All Collections for Advertisements, Subscriptions, etc., are made directly from this Office. We have Agents to solicit the same, but they are not authorized to Receipt for Money.*

TO OUR SUBSCRIBERS AND PATRONS.

In making remittances for subscriptions, always procure a draft on New York, or a POST OFFICE MONEY ORDER, if possible. Where neither of these can be procured, send the money, but always in a REGISTERED LETTER. The registration fee has been reduced to fifteen cents, and the registration system has been found by the postal authorities to be virtually an absolute protection against losses by mail. ALL Postmasters are obliged to register letters whenever requested to do so.

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ERRORS OF SCIENTIFIC WRITERS.

The American people are remarkable for the facility with which they acquire scientific and technical information from indifferent and unreliable sources, and also, as a consequence, perhaps, for the often imperfect and erroneous ideas thus obtained.

These reflections have been more forcibly and amusingly brought to mind recently, in looking over the various *pseudo*-scientific publications, mostly of ephemeral growth which flood the country.

A contemporary publication of acknowledged merit in certain specialties, but which assumes scientific versatility, recently published an article intended no doubt to instruct its readers, upon the character and method of manufacture of illuminating gas.

As some of the information thus given will be both novel and amnsing to practical gas men and others versed in the theory and art, we take the liberty to quote occasional paragraphs. After stating broadly that the buildings and streets of large cities throughout the civilized world are lighted with illuminating gas, composed of products of the distillation of bituminous coal, in close retorts; it then goes on to describe the retorts, which is well enough until it says: The *ends* of these retorts are *open* before they are set, but when placed in position the *inner* ends communicate with upright iron pipes or cylinders, which are secured at the top, and communicate with what is called the "hydraulic main." "The *outer* ends of the retorts are closed when in action etc."

This description is a possible method of setting retorts, but certainly not common nor probable.

Again it says: *One-hundred and twenty lbs.* of coal are used as a *charge* for each retort: It takes *about* six hours to work off one of these charges.

What do our Engineers who introduce 300 and 500 pound charges say to this. Would they be contented to run their works on such a scale? And what will they say to six hour charges in this progressive age of gas manufacture, when we have advocates of four and even three hour charging?

In speaking of the gas holder, it illustrates thus: After the process of purification is performed, the gas passes to the holder, an immense iron vessel inverted in a cistern containing water, *through which* the *gas bubbles up* under the receiver.

The writer evidently imagines the gas is *forced* up through the water in the tank. In continuation he says: "As the receiver descends by its own gravity when the gas is drawn off through the general service, a constant pressure may be maintained. We say *may* be maintained, for we have pointed out in previous articles? how a diminution of pressure *may be made to wrong the consumers* and enrich the producers."

The previous articles referred to it has not been our fortune to see, but we must confess to a strong desire to learn how the "diminution" of the pressure at the holder or elsewhere, can in any wise "wrong the consumers." Again: "The consumer may be wronged also by improper purification of gas, *paying for sulphurous or carbonic acid gases* the same price per cubic foot as for good gas, etc." Now does not the writer know that the *gas producer is the loser*, when these gases are not removed. That every per cent of carbonic gas diminishes the candle power nearly six per cent, and that it would cost infinitely more to supply a coal rich enough to bring up the candle power to standard, than the insignificant gain in volume? If not, we will undertake to give him the data, obtained by a series of elaborate tests by European scientists; and at a more recent date, repeated and corrected here by Professors SILLIMAN and WURTZ, showing conclusively that such is the case.

Want of time will not permit us to criticise this article more at present, but another time we may review another equally remarkable article, probably written by the same author.

Some ideas advanced in this article are sound and instructive, especially in regard to the fact that the exhalations from gas works are not generally deleterious to public health, as many people believe; but on the contrary, really act as a preventive of epidemic and sporadic complaints.

STERRY HUNT. ON THE CHEMISTRY OF COPPER.

Attention of Practical Men should be especially directed to the account commenced in our last issue (Feb. 16.), which will be concluded in our next, (March 16.), of a new wet metallurgical method, which is an outgrowth of some elaborate researches on Copper Compounds that were communicated to the ASSOCIATION at Salem last summer by Professor HUNT. The substance of this communication we shall recur to again.

In correspondence with Prof. HUNT we learn that an experienced Swansea metallurgist, in whom he has confidence, pronounces it, after trial, "the best process as yet devised for treating copper ores holding gold and silver." Works are erecting near Quebec and about to be commenced in Lancashire, England.

Doubtless we also, when we get the Metallurgy of this country out of the hands of empirics and into that of men of science, (a consumation hardly visible as yet, however) may be ready to reimport this American invention, as we have so many others. Prof. H. writes also among many other things that in the precipitation of the copper according to his plans "the saving in iron alone in England is five pounds sterling per ton of copper," the latter being also much purer and finer. He promises "an account of the working results which I expect to get this month for our process in the province."

In a later letter, Prof. HUNT says: "The great advantages are the very small amount of fuel required for the sulphatizing roasting, the small amount of iron consumed in precipitation, the rapidity with which this is effected (*i. e.* the precipitation of the first seven-eighths of the copper), and finally, the fact that there is no loss of any reagent, except the *equivalent* only of iron needed for precipitation, and a little lime. I find that Spanish ores well burnt in the Lancashire kilns, for Sulphuric Acid, give up to our bath after grinding the whole of their copper without any subsequent roasting. The solubility of the kernel of rich regulus (which they generally contain) in CuCl, in presence of NaCl, explains this remarkably complete result."

This new process is awakening much attention of a searching and critical kind here among practical and scientific men, since our publication of it in our last. The undersigned has held repeated conversations thereon with men of this class, but has yet to hear of any objection brought against the process which will hold water. If American capitalists are wise, they will *lose no time*, but look into this thing at once. HENRY WURTZ.

NOTICE OF NEW BOOKS, ETC.

GAS ENGINEER'S POCKET COMPANION.—We are in receipt of the Gas Engineers Pocket Companion, a very well gotten up little book of reference, contain-

ing a great amount of valuable information for Gas Engineers, and Gas Works Manufacturers and others. The tables of weights of piping, the rates of the flow of gas through different sized pipes, etc. etc., are compiled from the best standard English works; and will repay careful perusal.

The work is published by Messrs. Harris & Bro., the well known Gas Meter Manufarturers, Philadelphia, Pa.

PUBLIC LEDGER ALMANAC FOR 1870; George W. Childs, Publishers, Philadelphia.—This is a work gotten up annually by the publisher of the Philadelphia *Public Ledger*, and although especially intended for its 70,000 subscribers, it is valuable to every one. It is handsomely bound with illuminated cover, and contains, besides the almanac proper, a great variety of local and general information, statistics, anecdotes, receipts, poetry, rates of postage, table of distances, internal revenue laws, names of members of the forty-first congress, etc., etc, In fact it is "too good to keep" over a year, and should always, be at the hand of all who desire to keep posted.

THE TECHNOLOGIST.—The first number of this scientific monthly has been laid before us. It is especially devoted to Engineering, Manufacturing and Building, and is worthy of a place among the many Scientific Journals of the day. The article on "Technological Education" is very able. Among its many technological subjects we would call attention to those on "Tempering Steel," the "Manufacture of Lakes," and "Distribution." Subscription price $2 per annum; single copies 20 cts. It can be had at the office of the Industrial Publication Company, 176 Broadway, N. Y. or of the American News Company, 131 Nassau Street, N. Y.

Answers to Correspondents.

G. L, of Mass.—*Plasma* signifies "a thing formed." It is a Greek word, and is often used by English pharmaceutists as a name for certain ointments, and for certain compounds used to give consistency to pills and ointments, etc.

R. R., of Pa.—The greatest amount of rain falling in a year is said to be at a place in the Himalaya mountains amounting to about three hundred inches in depth, Enough if it fell all at once to cover the earth with water about twenty-five feet deep. In San Francisco, from thirty-five to forty inches fall annually.

G. A. V., of Ohio.—Terra alba is not an artificial product. It is a fine quality of gypsum stone reduced to a fine powder. It is obtained mostly from Derbyshire, England, and at Leith. It is largely used, it is said, in adulterating candy, and for various other purposes more legitimate and less hurtful, it is to be desired.

N. B., of N. Y.—Sulphate of copper is an excellent preservative of wood. The solution should be forced into the pores of the wood by pressure.

S. A. B., of Cal.—The exposure of mineral oils to the influence of the sun, causes them to absorb oxygen from the air converting it into ozone It changes the odor of the oils, and the ozone rapidly corrodes or oxydizes cork and other bodies capable of oxydation. It also modifies the combustibility of the oil, making it less combustible. Searchers for the great *desideratum*, non-explosive oil, may take a hint from this peculiar action of ozone.

T. B., of N. Y.—Cotton-leather is prepared by treating cotton fabrics in a similar manner to that in which hides and skins are treated for the manufacture of leather. Cotton treated in this manner acquires greater strength, and is less liable to decay. We do not know that it has been patented.

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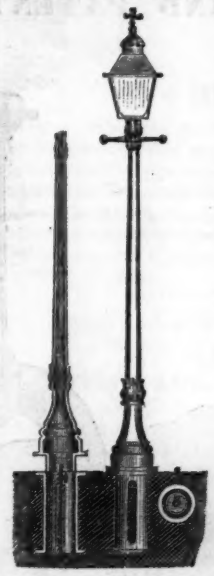
THE ADVANTAGES OF THIS PATENT POST over the old style, are as follows:



1st. The saving of the base or bottom part of the Post, when the column is broken, the Post being made in two parts. The broken column can be replaced by a new one, without disturbing the base.

2d. When the old style of post is broken, the bottom piece has to be dug out, which cannot be done in winter, or in wet weather: all this is obviated in this Post, as no digging is required. This style of Pos is especially desirable when flag stone sidewalks are used.

3rd. When a stoppage of gas in stand pipe occurs, the column can be lifted out, the pipe detached, cleaned, and replaced in fifteen minutes; no digging being required as is now done with the old Post.

4th. A lighter and better casting can be made from this patent, and it can be handled better, owing to its length and lightness.

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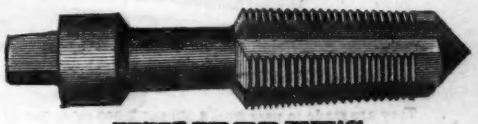
Certificate.

ST. LOUIS, September 1, 1869.

I have examined a new Lamp Post, the Branson patent, and unhesitatingly pronounce it to be the best thing of the kind I have ever seen. Posts of this description have been erected in this city, and in my opinion this style of Post should be universally adopted, as I believe it possesses all the advantages claimed for it.

The St. Louis Gas-Light Company have adapted this Post and ordered a large quantity for immediate use.

THOMAS PRATT,
537-6m Sup. St. Louis Gas Works.



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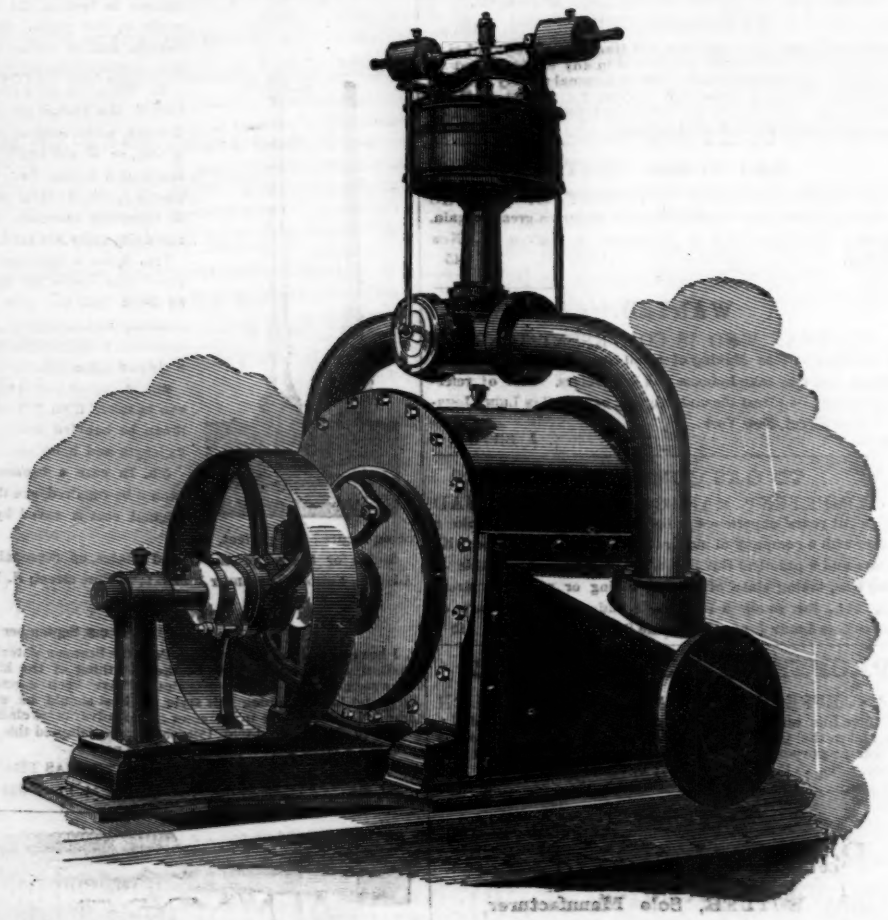

They are made to pass from 4,000 to 150,000 cubic feet of gas per hour; will increase the produc tion and illuminating power of he gas, and add very much to the durability of the retorts, eitheclay or iron. The Compensator obviates entirely the necessity of water-joints, is compact, durable cleanly, not liable to get out of order, self-acting, quiet, and certain in its operation.

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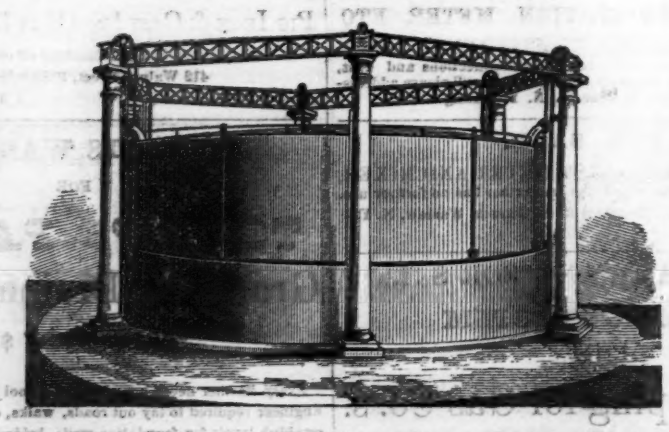

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FIG. 1.

. Fig. 1 shows a single gate valve.

Fig. 2 represents wedge and one-half of gate of double valve, intended for larger sizes, when required to bear heavy pressure either side.

Fig. 3, represents a section through body, gate and wedge.

The slides, G G, are held against wedge D, by ribs, H H, projecting from sides of valve body, A.

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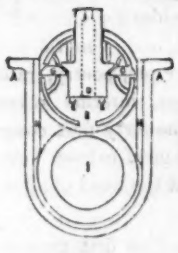

FIG. 3. FIG. 2.

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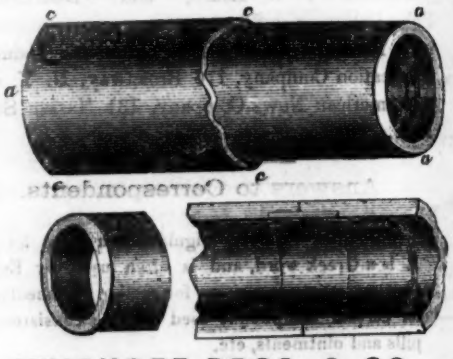

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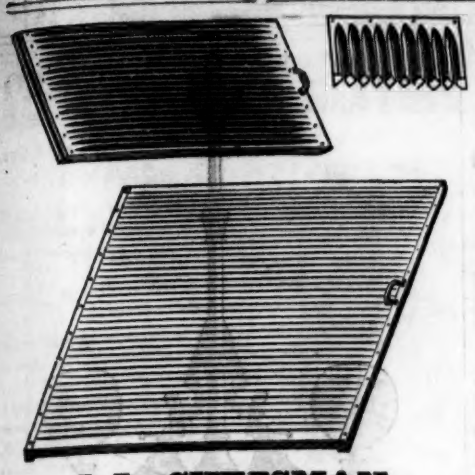

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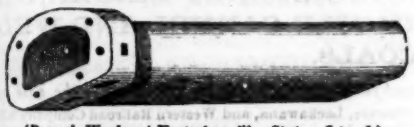

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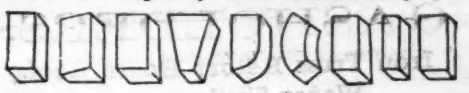

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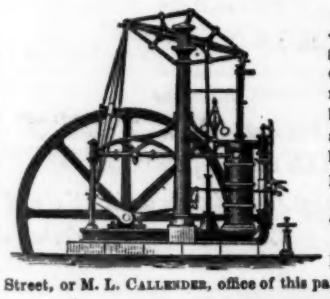

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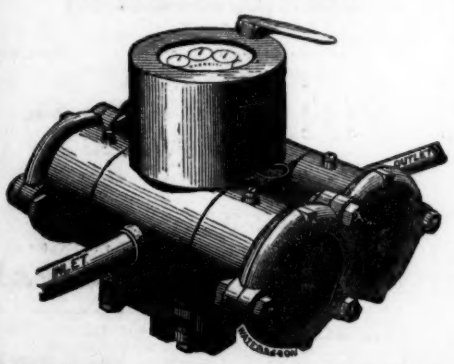

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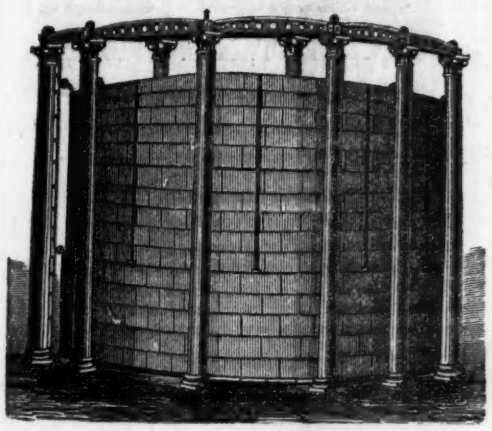

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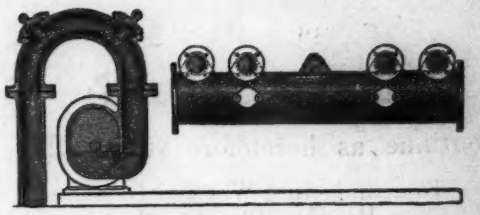

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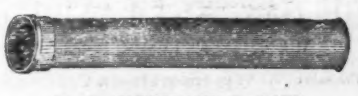

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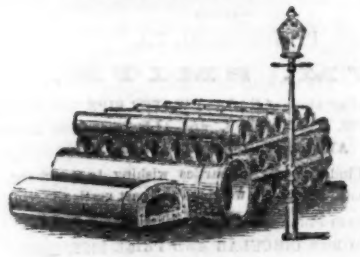

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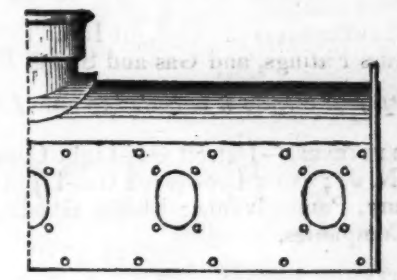

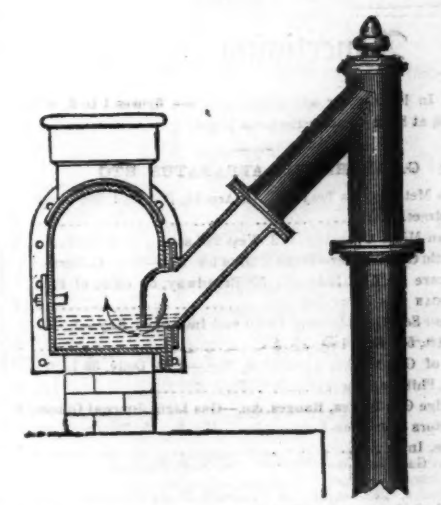

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Professor Henry Wurtz—Office Gas-Light Journal 2
Patent Lamp Post—Am. Gas-Light Journal, 28 Pine street 5
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